

WHAT IS CLAIMED IS:

1. Armament apparatus for an aircraft, comprising:

a landing gear structure;

5 a mounting member secured to said landing gear structure and having an opening extending therethrough along a first axis;

an elongated support arm extending along a vertically inclined second axis and having a lower end coaxially received in said mounting member opening, and an upper end;

10 machine gun support structure secured to said upper end of said support arm; and

attachment structure nonrotatably locking said lower end of said support arm to said mounting member.

15 2. The armament apparatus of Claim 1 wherein:

said landing gear structure is a sponson structure having a tow plate, and

said mounting member is secured to said tow plate.

20 3. The armament apparatus of Claim 1 further comprising:

an external stores support structure projecting outwardly from said landing gear structure in an outboard direction and having an outboard end portion on which external stores apparatus may be mounted.

4. The armament apparatus of Claim 3 wherein:

said mounting member has an end portion disposed outboard of said lower end of said elongated support member, and

5 said external stores support structure is secured to said end portion of said mounting member.

5. The armament apparatus of Claim 3 further comprising:

external stores apparatus secured to said outboard end portion of said external stores support structure.

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6. The armament apparatus of Claim 5 wherein:

said external stores apparatus is a missile launcher assembly.

7. The armament apparatus of Claim 3 wherein:

15 said outboard end portion of said external stores support structure is pivotally adjustable relative to the balance of said external stores support structure about at least one axis.

8. The armament apparatus of Claim 7 wherein:

20 said outboard end portion of said external stores support structure is pivotally adjustable relative to the balance of said external stores support structure about a horizontal axis.

9. The armament apparatus of Claim 3 wherein:

one of said external stores support structure and said mounting member has a lug projection thereon, and

the other of said external stores support structure and said mounting member has a spaced pair of flanges thereon, said lug projection being captively retained between said flanges.

10. The armament apparatus of Claim 3 wherein:

said outboard end portion of said external stores support structure includes a housing structure and a bomb rack carried by said housing structure for pivotal movement therewith relative to the balance of said external stores support structure, and

said armament apparatus further includes threaded adjustment members operative to pivotally adjust said housing and said bomb rack relative to the balance of said external stores support structure.

11. The armament apparatus of Claim 1 further comprising:

a machine gun carried by said machine gun support structure and being rotatable about a generally vertical third axis and angled relative to said second axis, and about a fourth axis transverse to said third axis.

12. The armament apparatus of Claim 11 wherein:

said machine gun is a .50 caliber machine gun.

13. The armament apparatus of Claim 1 wherein:

said aircraft is a helicopter.

14. The armament apparatus of Claim 1 wherein:

said attachment structure includes a pin structure extending through said mounting member and said lower end of said support arm transversely to said first axis.

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15. Armament apparatus for an aircraft, comprising:

a landing gear structure;

a mounting member secured to said sponson structure, said mounting member having an opening extending therethrough along a first axis, said opening having axially spaced apart conically tapered first and second annular interior surface portions;

an elongated support arm extending along a second axis and having a first end portion coaxially received in said support member opening, and a second end portion spaced apart from said first end portion along said second axis, said first end portion having a conically tapered annular exterior surface portion complementarily engaging said first interior surface portion of said mounting member opening;

a machine gun support member secured to said second end of said support arm and extending along a third axis angled relative to said second axis; and

attachment structure locking and stabilizing said first end portion of said support arm within said opening in said mounting member.

16. The armament apparatus of Claim 15 wherein:

said landing gear structure is a sponson structure having a tow plate, and

said mounting member is secured to said tow plate.

17. The armament apparatus of Claim 15 wherein:

said aircraft is a helicopter.

18. The armament apparatus of Claim 15 wherein:

said attachment structure includes a tapered annular collet member
circumscribing said first end portion of said support arm and being held in
forcible, complementary engagement with said second interior surface
5 portion of said mounting member by a nut threaded onto said first end
portion of said elongated support arm.

19. The armament apparatus of Claim 18 wherein:

said attachment structure further includes a pin structure
10 transversely extending through said mounting member and said first end
portion of said elongated support arm.

20. The armament apparatus of Claim 15 wherein:

said attachment structure includes a pin structure transversely
15 extending through said mounting member and said first end portion of
said elongated support arm.

21. Armament apparatus for an aircraft, comprising:

a landing gear structure having front, rear and outboard side portions;

an elongated machine gun support arm member having a lower end
5 secured to said landing gear structure, said machine gun support arm member longitudinally extending along a rearwardly and upwardly inclined axis; and

an external stores support structure secured to said landing gear structure and projecting therefrom in an upwardly sloped outboard
10 direction, said external stores support structure having an outboard end portion with a latching section operative to releasably engage and support external stores apparatus.

22. The armament apparatus of Claim 21 wherein:

15 said armament apparatus further comprises a mounting member secured to said landing gear structure, and

said lower end of said support arm member and an inboard portion of said external stores support structure are secured to said mounting member.

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23. The armament apparatus of Claim 21 wherein:

said outer end portion of said external stores support structure is pivotally adjustable about at least one axis relative to the balance of said external stores support structure.

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24. The armament apparatus of Claim 21 wherein:
said aircraft is a helicopter.

5 25. The armament apparatus of Claim 21 wherein:
said landing gear structure is a sponson tow plate.

26. Armament apparatus for an aircraft, comprising:

a landing gear structure;

an elongated support arm having a lower end anchored to said landing gear structure, and an upper end positioned at a higher level than said lower end;

machine gun support structure mounted on said upper end of said support arm for azimuth rotation relative thereto about a generally vertical axis, and elevation rotation about a generally horizontal axis; and

elevation limiting structure associated with said machine gun support structure and operative to variably limit the available elevation rotation of said machine gun support structure in response to azimuth rotation thereof.

27. The armament apparatus of Claim 26 wherein:

said landing gear structure includes a tow plate, and said lower end of said support arm is anchored to said tow plate.

28. The armament apparatus of Claim 27 wherein:

said aircraft is a helicopter.

29. The armament apparatus of Claim 26 wherein:

said machine gun support structure is pivotable through an azimuth arc having first and second portions, and

said elevation limiting structure is operative to provide different available elevational arcs for said machine gun support structure in each of said first and second azimuth arc portions.

30. The armament apparatus of Claim 29 wherein:

said elevation limiting structure is operative, in response to azimuth rotation of said machine gun support structure to provide a different downward rotation limit for said machine gun support structure in each
5 of said first and second azimuth arc portions.

31. The armament apparatus of Claim 30 wherein:

said machine gun support structure is a cradle assembly,

said armament apparatus further includes a yoke assembly
10 underlying said cradle assembly, said cradle assembly being secured to said yoke assembly and pivotable relative thereto about said generally horizontal axis, a vertical post structure secured to said upper end of said support arm and having a horizontal azimuth stop plate portion, said yoke assembly being secured to said post structure and being pivotable relative
15 thereto about said generally vertical axis, and

said elevation limiting structure includes an elevation limiting member carried by said yoke assembly for vertical movement relative thereto, in response to rotation of said yoke assembly about said generally vertical axis, between first and second positions in which said elevation
20 limiting member variably blocks downward pivotal movement of said yoke assembly.

32. The armament apparatus of Claim 31 wherein:

said azimuth stop plate portion has an upper side with a ramped cam track disposed thereon,

said elevation limiting member has a lower rolling portion engaging

5 said track, and

said elevation limiting structure further includes a spring member resiliently biasing said elevation limiting member downwardly toward said upper side of said azimuth stop plate portion.

33. Machine gun mounting apparatus comprising:

a support member having spaced apart first and second portions;

a machine gun support structure secured to said first portion for azimuth and elevational rotation relative thereto respectively about mutually perpendicular first and second axes; and

elevation limiting structure operative to variably limit the available elevational rotation of said machine gun support structure, in different azimuth arc portions, in response to azimuth rotation thereof.

34. The machine gun mounting apparatus of Claim 33 wherein:

said elevation limiting structure includes an elevation limiting member carried by said support structure for variable movement relative to the balance thereof, parallel to said first axis, in response to azimuth rotation of said support structure about said first axis.

35. The machine gun mounting apparatus of Claim 34 wherein:

said support structure includes a machine gun support cradle elevationally pivotable about said second axis, and

said elevation limiting member is operative to variably block downward elevation movement of said cradle structure in response to rotation of said support structure about said first axis.

36. Machine gun mounting apparatus comprising:

a support structure having opposing mounting blocks with facing openings therein;

5 a machine gun trunnion nut securable to a machine gun at the juncture of its receiver and barrel portions and having a diametrically opposed pair of nonthreaded radially extending openings therein, said trunnion nut being positionable between said mounting blocks with said openings in said trunnion nut being aligned with said openings of said mounting block;

10 a pair of non-threaded trunnion studs each positionable in a locking orientation within one of the mounting block openings and an adjacent trunnion nut opening; and

a retaining structure for releasably retaining said trunnion studs in said locking orientations thereof.

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37. The machine gun mounting apparatus of Claim 36 wherein:

said retaining structure includes first pin openings extending transversely through said studs, second pin openings extending through said mounting blocks and being alignable with said first pin openings
20 when said studs are operatively received in said mounting block and trunnion nut openings, and retaining pins removably insertable in the aligned mounting block and stud openings.

38. The machine gun mounting apparatus of Claim 36 wherein:

25 each of said studs has a non-threaded cylindrical body complementarily receivable in one of said mounting block openings, and a reduced diameter cylindrical inner end portion complementarily receivable in one of said trunnion nut openings.

39. The machine gun mounting apparatus of Claim 36 wherein:
each of said trunnion nut openings is lined with an annular, case-hardened steel bushing.

5 40. The machine gun mounting apparatus of Claim 36 wherein:
said support structure is a cradle structure having shock absorbers operably incorporated therein.

41. Armament apparatus for an aircraft, comprising:

a landing gear structure;

a machine gun support arm member secured to said landing gear structure and projecting in an outboard direction therefrom, said mounting member having a machine gun support arm end-receiving opening extending therethrough along a rearwardly and upwardly inclined axis, and at least one arm locking opening extending therethrough along a second axis transverse to said first axis; and

external stores apparatus secured to said machine gun mounting member outboard of said support arm end-receiving opening.

42. The armament apparatus of Claim 41 wherein:

said external stores apparatus is a missile launcher assembly.

43. The armament apparatus of Claim 41 wherein:

said aircraft is a helicopter

said landing gear structure includes a sponson tow plate, and

said machine gun mounting member is secured to said sponson tow plate.

44. The armament apparatus of Claim 41 wherein:

said support arm end-receiving opening has first and second oppositely and conically tapered interior surface portions spaced apart along said first axis.

45. Armament apparatus for an aircraft, comprising:

a landing gear sponson structure having a tow plate with front portion, a rear portion, and a central portion disposed between said front and rear portions;

5 a machine gun mounting member secured to said central tow plate portion; and

a flare dispenser secured to said rear portion of said tow plate.

46. The armament apparatus of Claim 45 wherein:

10 said aircraft is a helicopter.

47. The armament apparatus of Claim 45 wherein:

said machine gun mounting member has a machine gun support arm end-receiving opening extending therethrough along a rearwardly and upwardly inclined first axis.

48. The armament apparatus of Claim 47 wherein:

said machine gun mounting member has at least one locking opening extending therethrough along a second axis transverse to said first axis.

49. The armament apparatus of Claim 45 further comprising:

a forward-looking infrared sensor secured to said front portion of said tow plate.

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50. Armament apparatus for an aircraft, comprising:

a landing gear sponson structure having a tow plate with a front portion, a rear portion, and a central portion disposed between said front and rear portions; and

5 a forward-looking infrared sensor secured to said front portion of said landing gear sponson structure.

51. The armament apparatus of Claim 50 wherein:

10 the infrared sensor is disposed forwardly of said front end of said tow plate.

52. The armament apparatus of Claim 50 wherein:

said infrared sensor has an upper end portion, and

15 said infrared sensor is secured to said front tow plate portion by a mounting structure having a first mounting portion anchored to said front tow plate portion, an elongated support member longitudinally extending forwardly from said first mounting portion and having a forward end, and a second mounting portion secured to said forward end and to said upper end of said infrared sensor.

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53. Armament apparatus for an aircraft, comprising:

a landing gear sponson structure having a tow plate with a front portion, a rear portion, a central portion disposed between said front and rear portions, and an outboard side;

5 a hollow support block structure secured to said central portion and projecting outwardly from said outboard side;

a rearwardly and upwardly inclined elongated support arm member having a lower end secured within said support block structure, and an upper end;

10 a machine gun rotatably mounted on said upper end of said support arm member;

external stores apparatus secured to said hollow support block structure outboard of said support arm member;

a flare dispenser secured to said rear portion of said tow plate; and

15 a belted ammunition box secured to said tow plate above said hollow support block structure and disposed inboard of said support arm member.

54. The armament apparatus of Claim 53 wherein:

20 said external stores apparatus is a missile launcher assembly.

55. The armament apparatus of Claim 53 wherein:

said aircraft is a helicopter.

25 56. The armament apparatus of Claim 53 further comprising:

a forward-looking infrared sensor secured to said front portion of said tow plate.

57. The armament apparatus of Claim 53 wherein:
said machine gun is a 0.50 caliber machine gun.\

58. The armament apparatus of Claim 53 wherein:
5 said machine gun is rotatable about a generally vertical but upwardly
and forwardly inclined axis.

59. the armament apparatus of Claim 58 wherein:
said axis is forwardly inclined at an angle of approximately three
10 degrees.

60. The armament apparatus of Claim 53 wherein:
said missile launcher is disposed outboard of said support block
structure.
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61. The armament apparatus of Claim 53 wherein:
said missile launcher is pivotally adjustable relative to said support
block structure about at least one axis.

62. Belted ammunition storage and feed apparatus for a machine gun, comprising:

a belted ammunition storage box having an outlet opening;

a booster housing removably secured to said storage box over said outlet opening and having an ammunition discharge opening, and an access opening; and

a sprocketed electric drive motor structure operable to drive belted ammunition from the interior of said ammunition storage box sequentially through said outlet opening and said ammunition discharge opening, said drive motor structure being releasably latched within said booster housing and being removable therefrom and installable therein, via said access opening, without the use of a tool.

63. The belted ammunition storage and feed apparatus of Claim 62 wherein:

said drive motor structure has opposite mounting end portions with openings extending therethrough,

said booster housing has first and second sets of spaced mounting portions with mounting openings therein,

each said mounting end portion is disposed between the booster housing mounting portions in one of said first and second sets thereof, and

said belted ammunition and feed apparatus further comprises first and second pin structures extending through said openings in said drive motor end portion openings and said booster housing mounting portion openings and captively retaining said drive motor within said booster housing, said first and second pin structures being removable from said

booster housing to thereby release said drive motor structure and permit it to be moved outwardly through said access opening.

64. The belted ammunition storage and feed apparatus of Claim 63
5 wherein:
said access opening faces said outlet opening.

65. The belted ammunition storage and feed apparatus of Claim 63
wherein:
10 said mounting end portions are generally disc-shaped, and
said mounting openings in said mounting end portions extend
diametrically therethrough.

66. The belted ammunition storage and feed apparatus of Claim 65
15 wherein:
said mounting end portion openings laterally open outwardly
through outer side portions of said mounting end portions.

67. Armament apparatus for an aircraft, comprising:

a landing gear sponson structure;

a machine gun supported on said sponson structure;

5 a belted ammunition storage box having an outlet opening and being supported on said sponson structure;

a booster housing secured to said storage box over said outlet opening and having an ammunition discharge opening, and an access opening; and

10 a sprocketed electric drive motor structure operable to drive belted ammunition from the interior of said ammunition storage box sequentially through said outlet opening and said ammunition discharge opening, said drive motor structure being releasably latched within said booster housing and being removable therefrom and installable therein, via said access opening, without the use of tools.

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68. The armament apparatus of Claim 67 wherein:

said drive motor has opposite mounting end portions with openings extending therethrough,

20 said booster housing has first and second sets of spaced mounting portions with mounting openings therein,

each said mounting end portion is disposed between the booster housing mounting portions in one of said first and second sets thereof, and

25 said belted ammunition and feed apparatus further comprises first and second pin structures extending through said openings in said drive motor end portion openings and said booster housing mounting portion openings and captively retaining said drive motor structure within said booster housing, said first and second pin structures being removable

from said booster housing to thereby release said drive motor and permit it to be moved outwardly through said access opening.

69. The armament apparatus of Claim 68 wherein:

5 said access opening faces said outlet opening.

70. The armament apparatus of Claim 68 wherein:

 said mounting end portions are generally disc-shaped, and

10 said mounting openings in said mounting end portions extend
 diametrically therethrough.

71. The armament apparatus of Claim 70 wherein:

 said mounting end portion openings laterally open outwardly
 through outer side portions of said mounting end portions.

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72. A method of controlling the available movement of a machine gun, said method comprising the steps of:

supporting the machine gun for rotation about mutually perpendicular first and second axes, and

5 variably limiting the range of rotation of the supported machine gun about said first axis in response to rotation of the supported machine gun about said second axis.

73. The method of Claim 72 wherein:

10 said variably limiting step is performed in a manner providing for the machine gun separate available pivotal ranges about said first axis when said machine gun is respectively within first and second pivotal ranges about said second axis.

15 74. The method of Claim 73 wherein:

said supporting step is performed in a manner such that said first axis is generally horizontal and said second axis is generally vertical.

75. The method of Claim 73 wherein:

20 said variably limiting step is performed using a blocking structure, movable in opposite directions parallel to said first axis in response to rotation of said machine gun about said first axis, to variably block rotational movement of said machine gun about said first axis.

76. A method of constructing ammunition storage and feed apparatus for a machine gun, said method comprising the steps of:

providing a belted ammunition storage box having an ammunition belt outlet opening;

5 providing a booster housing having an ammunition discharge opening and an access opening;

installing, without the use of a tool, a sprocketed electric drive motor structure in said booster housing in a manner permitting the installed drive motor structure to be subsequently removed from said booster housing, through said access opening, without the use of a tool,
10 the installed drive motor structure being useable, when said booster housing is operatively installed on said storage box over said outlet opening thereof, to drive belted ammunition from the interior of said storage box sequentially through said outlet opening and said ammunition
15 discharge opening; and

operatively securing said booster housing to said storage box over said outlet opening.

77. The method of Claim 76 wherein said installing step includes the
20 steps of:

providing said booster housing with a pair of facing wall openings, forming a connection opening in said electric drive motor structure, placing said drive motor structure in said booster housing with said connection opening disposed between said wall openings, and

25 releasably inserting a retaining pin into said wall openings and said connection opening.

78. The method of Claim 77 wherein:

said releasably inserting step is performed using a ball detent pin.

79. the method of Claim 77 wherein:

5 said electric drive motor structure has a generally annular outer end portion having diametrically opposite outer side slots that together define said connection opening, and

 said releasably inserting step includes the step of releasably extending said retaining pin through said slots.

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80. A method of mounting a machine gun on a support structure having a spaced apart pair of facing mounting members with aligned openings therein, said method comprising the steps of:

5 mounting a trunnion nut member on the machine gun, said trunnion nut having a diametrically opposed pair of nonthreaded openings extending radially therethrough,

positioning said trunnion nut member between said mounting members with said trunnion nut openings aligned with said mounting member openings;

10 providing a pair of nonthreaded locking members;

positioning first portions of said locking members in said mounting member openings, and second portions of said locking members in said trunnion nut openings; and

15 releasably locking said first locking member portions within said mounting member openings.

81. The method of Claim 80 wherein:

20 said releasably locking step is performed by extending locking members through aligned openings in said mounting members and said first locking member portions.

82. the method of Claim 80 wherein:

25 said method further comprises the step of configuring each of said locking members to have a cylindrical non-threaded body portion sized to be complementarily received in one of said mounting member openings, and a reduced diameter non-threaded inner end portion sized to be complementarily received in one of said trunnion nut member openings.

83. A method of arming an aircraft having a landing gear structure, said method comprising:

securing a mounting member to said landing gear structure, said mounting member having an opening extending therethrough along an upwardly and rearwardly inclined axis;

providing an elongated support arm member having first and second end portions spaced apart along an axis;

coaxially anchoring said first end portion of said support arm within said mounting member opening;

supporting a machine gun on said second end portion of said support arm for azimuth and elevational rotation relative thereto respectively about generally vertical and horizontal axes; and

supporting external stores apparatus on said mounting member outboard of said support arm member.

84. The method of Claim 83 wherein:

said step of supporting external stores apparatus is performed in a manner permitting pivotal adjustment of said external stores apparatus about at least one axis.

85. The method of Claim 83 wherein:

said aircraft is a helicopter.

86. The method of Claim 83 wherein:

said landing gear structure includes a tow plate, and

said securing step is performed by securing said mounting member to said tow plate.

87. The method of Claim 83 wherein:

said coaxially anchoring step includes the step of extending at least one retaining pin member through said mounting member and said first end portion of said elongated support arm member along an axis transverse to the axes of said mounting member opening and said support arm member.

88. The method of Claim 83 wherein:

said first end portion of said support arm member has a conically tapered annular exterior side surface area,

said mounting member opening has a conically tapered annular interior surface area, and

said coaxially anchoring step includes the step of forcibly holding said conically tapered annular surface areas of said first support arm member end portion and said mounting member opening in a complementary engagement with one another.

89. A method of arming an aircraft having a landing gear structure with a front portion, said method comprising the steps of:

providing a forward-looking infrared sensor; and

mounting said forward-looking infrared sensor on said front portion

5 of said landing gear structure.

90. The method of Claim 89 wherein:

said aircraft is a helicopter.

10 91. The method of Claim 89 wherein:

said landing gear structure includes a sponson tow plate having a front edge portion, and

said mounting step is performed by mounting said sensor on said front edge portion.

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92. The method of Claim 91 wherein:

said mounting step is performed in a manner positioning said sensor in a forwardly spaced relationship with said front edge portion of said tow plate.

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93. A method of arming an aircraft having a landing gear structure with a front portion, a rear portion, and a central portion disposed between said front and rear portions, said method comprising the steps of:

- 5 securing a machine gun mounting member to said central portion of said landing gear structure;
- providing an elongated support arm member;
- attaching a first end portion of said support arm member to said mounting member in a manner such that a second end portion of said
- 10 support arm member is rearwardly and upwardly offset from said mounting member;
- mounting a machine gun on said second end portion of said support arm member for rotation about a pivot area; and
- securing a flare dispenser to said rear portion of said landing gear
- 15 structure in a manner positioning said flare dispenser generally beneath said pivot area of said machine gun.

94. The method of Claim 93 wherein:
said mounting step is performed using a 0.50 caliber machine gun.

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95. The method of Claim 93 wherein:
said aircraft is a helicopter.

96. The method of Claim 93 wherein:
25 said landing gear structure is a sponson tow plate.

97. A method of arming an aircraft having a landing gear sponson structure having a tow plate with a front portion, a rear portion, a central portion disposed between said front and rear portions, and an outboard side, said method comprising the steps of:

5 securing a hollow support block structure to said central portion of said tow plate with said support block structure projecting outwardly in an outboard direction therefrom;

 anchoring a lower end portion of an elongated, substantially straight support arm member within said support block structure in a manner such
10 that a second end portion of said support arm member is rearwardly and upwardly offset from said support block structure;

 mounting a machine gun on said second end portion of said support arm member for rotation about a pivot area;

 securing external stores apparatus to said support block structure in
15 a manner positioning said missile launcher structure outboard of said support block structure;

 securing a flare dispenser to said rear portion of said tow plate generally beneath said pivot area of said machine gun; and

 securing a belted ammunition box to a top side edge portion of said
20 tow plate above said support block structure and inboard of said support arm member.

98. The method of Claim 97 further comprising the step of:

 securing a forward-looking infrared sensor to said front portion of
25 said tow plate.